Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

the central spindle during division as in Noctiluca and many Metazoa. A distinct centrosome was found only in Noctiluca. The nuclei of most Protozoa belong, however, to aberrant types, which seem to have developed along divergent paths and only remotely resemble the more primitive forms on the one hand and the higher forms on the other. Examples of these aberrant types are found in *Amœba proteus*, Ceratium, Noctiluca, and the Infusoria in general. Chromosome formation is first seen in flagellates in the form of rods which arise by the union of the scattered chromatin granules. They form in the typical, though primitive, metazoan manner in Noctiluca and Euglypha, and all metazoan cells pass through these stages in preparing for mitosis.

C. A. K.

The Plotting of Biological Data in which it is necessary to exhibit an enormous range of numbers, as, for example, in certain lines of plankton work, presents a practical difficulty which may be obviated by a simple method suggested by Mr. D. J. Scourfield.[1] This is the use of logarithmically ruled paper, or of ordinary cross-section paper by the assignment of suitable values to the lines. Thus millimeter paper may be used if the centimeter lines are held to represent 1, 10, 100, 1000, etc., and the intermediate millimeter lines are given the numerical values whose logarithms are 0.1, 0.2, 0.3, 0.4, etc. For ordinary biological data, logarithmic ruling in one direction only is required, though for certain problems, *e.g.*, the plotting of variations of a rapidly increasing number of organisms, paper ruled in this manner in both directions might be used. This method of graphic presentation of biological statistics has the additional advantage of exhibiting *proportionate* changes in numbers by lines having the same angle of slope wherever situated in the chart.

C. A. K.

ZOÖLOGY.

Relationships of North American Grouse and Quail. — Dr. H. L. Clark has just published one of his useful papers on the feather-tracts of birds; in this case on those of the North American grouse and quail. The work of Nitzsch is thus carried on and[2] extended,

---

[1] Scourfield, D. J. The Logarithmic Plotting of Certain Biological Data, *Journ. Quek. Micr. Club*, Ser. II, vol. iv (1897), pp. 419–423, Pl. XX.

[2] Clark, Hubert Lyman, Ph.D., Instructor in Zoology, Amherst College. The

Dr. Clark having the advantage of almost exclusively basing his observations on fresh birds instead of dried skins, thereby escaping many errors unavoidable to his predecessor and being enabled to go into such details as are demanded by the more refined requirements of modern science. Thus, while Nitzsch only examined the skins of 5 species within the frame of Dr. Clark's article, the latter could work with 65 specimens in the flesh, representing 18 species and all the genera of the territory in question. His careful descriptions and figures are, therefore, very valuable to the systematic ornithologist, and the conclusions he bases upon them entitled to great consideration. But while thus restricted to fresh material, he is also limited to a small number of forms of the groups he treats of, and while this limitation in no way lessens the usefulness of the material, which he thus places in the hand of the working systematist, it naturally interferes with the trustworthiness of the generalizations.

In discussing his "conclusions" (pp. 651–653) it should be borne in mind, however, that Dr. Clark has been very careful and guarded in expressing his views, and that he has avoided to be dogmatic; nor does he claim that much light has been shed upon the origin or relationships of the larger groups. The relationships of the various genera within these groups, however, he thinks "is at least suggested by these investigations" to the extent that he ventures to express them in diagrams which look suspiciously like "stammbaums." But I am not certain that they mean more than a diagrammatic representation of the pterylographic "relationships" without reference to the true phylogeny of the species, unless he really believes that the pterylographic characters alone are sufficient to indicate the various shades of interrelation or the course followed in the evolution of these genera. This uncertainty is indicated by his speaking of the diagrams as "pointing out the relationship of the genera," though in the next moment he selects a type at the bottom of the series simply for the practical convenience of having "a starting point from which to develop the other genera." Seeing, however, that the diagrams have no real value unless meant for "ephylogenetic trees," whether standing on their roots or their tops, I shall discuss them from the latter point of view.

It is then plain that Dr. Clark, in spite of his guarded reservation, really regards the trees as standing on their roots, for he is careful to select the genera he starts from, on account of characters which

Feather-Tracts of North American Grouse and Quail, *Proc. U. S. Nat. Mus.*, vol. xxi (1898), No. 1166, pp. 641–653, Pls. XLVII–XLIX.

he claims to be more generalized than those of the other genera. As one of these generalized characters he regards the small number of rectrices, assuming that the forms with more numerous tail-feathers have increased them in the course of development. Thus he remarks that "*Dendragapus* has developed from *Canace* by . . . a marked increase in the number of rectrices." I think there can be no doubt that this is a fundamental error. The whole development of the tail of the birds shows that the generalized condition is that of numerous rectrices, and that the specialization, so far as number goes, consists in their reduction. I doubt very much that a pair of rectrices once *lost* can ever be redeveloped. If a reduction has already taken place and for some cause or another the tail is to answer a purpose temporarily suspended during the course of the evolution of a form, other feathers which have not undergone the retrograde movement are taken into employ and developed so as to serve the same purpose. Thus in many cases the upper tail-coverts have had to function as rectrices, with the result that very often it is difficult to tell them apart structurally from the true rectrices, while in one case, at least, the under tail-coverts have so completely assumed the rôle of the tail that they were generally regarded as true rectrices until it was discovered that the so-called tail-feathers were turned completely underside up!

I believe it is equally erroneous to assume that a structure so highly specialized as the "top-knot" of the California Partridge (*Lophortyx*) could be changed into the simple structure of the Mountain Partridge (*Oreortyx*), and while admitting the possibility of its disappearance and the development of the other feathers on the crown into a loose crest like that of the Scaled Partridge (*Callipepla*), I see no necessity for such an assumption, especially as the latter seems to show no apterium on the top of the head to account for the lost special tract. The more natural explanation seems to be to regard all these forms as having originated independently from more generalized types.

But apart from this last objection, which is one of detail, it will not do to turn Dr. Clark's trees upside down; they will not give us the true ascent of the genera, for the reason that he has assumed them to descend directly from the most generalized living form. He has not taken into account the fact that the genus among the extant forms, which in its totality shows the greatest amount of generalized characters, may have acquired one or more highly specialized peculiarities, thus showing that it is somewhat outside the direct line of ascent.

We shall now apply these principles in an attempt at reconstructing the genealogic tree of the North American partridges or quails, chiefly from the pterylographic characters.

In viewing these forms it seems thus evident that we have two groups, the members of which bear closer relationship to each other than to those of the other group. On the one hand, we have *Colinus* and *Cyrtonyx;* on the other, *Callipepla, Oreortyx,* and *Lophortyx.* The relationship of the former is obvious. The speckled-backed *Cyrtonyx* cannot well have developed through stages like those of the plain-backed *Lophortyx* and *Callipepla,* as suggested by Dr. Clark; and this character alone goes a long way to show the more generalized status of *Colinus* and *Cyrtonyx. Cyrtonyx,* with its higher developed crest, differentiated ventral feather-tract, reduced tail, and wanting claw to the thumb, is manifestly the more highly specialized form, thus leaving *Colinus* on the bottom round of the ladder. This is the same position given it by Dr. Clark it will be observed. The only difference between us is that he places it there because, among other generalized characters, it possesses 12 rectrices, while I give it a similar place *in spite* of this fact. By placing it lower than *Callipepla,* with 14 rectrices, I suggest that while *Colinus* has already lost a pair, *Callipepla* is, on the whole, a more specialized form, in spite of the fact that it has retained the greater number of rectrices. If, therefore, the two groups of quail have a common origin, this ancestor is obviously below the line of the beginning of our tree, having in all probability a speckled plumage like *Colinus,* 14 rectrices and 16 secondaries.

Of the 3 members of the second group it is only necessary to say that *Callipepla,* with its 14 rectrices and loose crest, is the more generalized form, probably descended from an ancestor with 16 secondaries, by reduction to 14. From this ancestor *Oreortyx* ascended, on the one hand, by further specializing the crest, though retaining the 16 secondaries; while, on the other hand, *Lophortyx* lost two of the latter, besides assuming a still more complicated top-knot.

Assuming, then, the common origin of these genera, I substitute the following diagram as probably representing more nearly the true course of the development diagram of these forms.

The question of the genealogy of the North American *Tetraoninæ* is one greatly more complicated, for the reason that two of the genera apparently hold closer relationships to forms not occurring in this hemisphere than to the genera which are restricted to our continent.

Obviously *Bonasa*, with its partly naked tarsus, a very unusual thing in this group, stands apart from all the other American genera, and the fact that it has developed a special feather-tract on each side of the neck does not necessarily indicate any close relationship with *Tympanuchus*, much less that it has an origin in common with the latter. The general characters of *Lagopus* do not seem to imply a *special* relationship to *Canace*, and may only mean the greater lack of specialization of both and their comparative nearness to the common ancestor of all the grouse. *Centrocercus*, on the other hand, shows a number of extremely specialized characters alongside of the retention of generalized ones, and while it may share origin with *Pediocætes*, there is no reason for believing that they have descended from *Canace*, which seems more closely allied to *Dendragapus* and *Tympanuchus* in spite of the specialization of the neck-tracts of the latter.

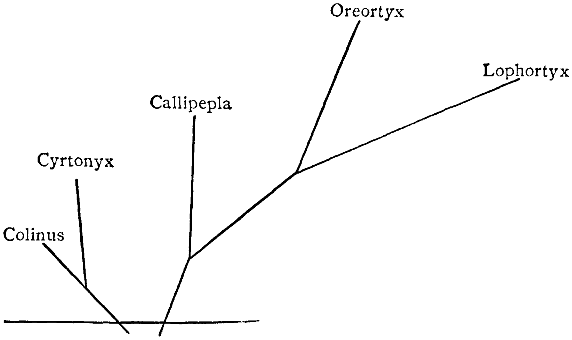

Diagram illustrating the possible development of the North American quail as divulged in their pterylographic characters.

It is to be hoped that Dr. Clark may be able to carry his investigations on fresh material in this field farther, and especially that he may succeed in extending it to more forms of the so-called peristeropod Gallinæ, the Curassons and Guans, in Central and South America. He may then be able to point to more definite and trenchant characters between them and the alecteropods, in which connection I would call attention to the alleged presence of a "bastard secondary" in the latter and its absence in the former. The peristeropods are, on the whole, considered to be more generalized, but highly specialized pterylographic features are apparent in many forms — a feature which should not obscure the general proposition.

LEONHARD STEJNEGER.